

City of Allentown Update

EPA/DEP Meeting

June 14, 2016



Outline

Overview of Corrective Action Plan Development

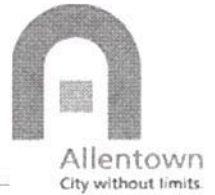
Phase 1 Recap

Phase 2

Selection of Final Alternative

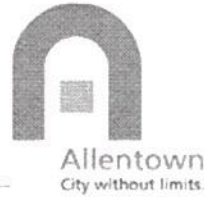
Blending vs. Flow Equalization

COA Corrective Action Plan Development

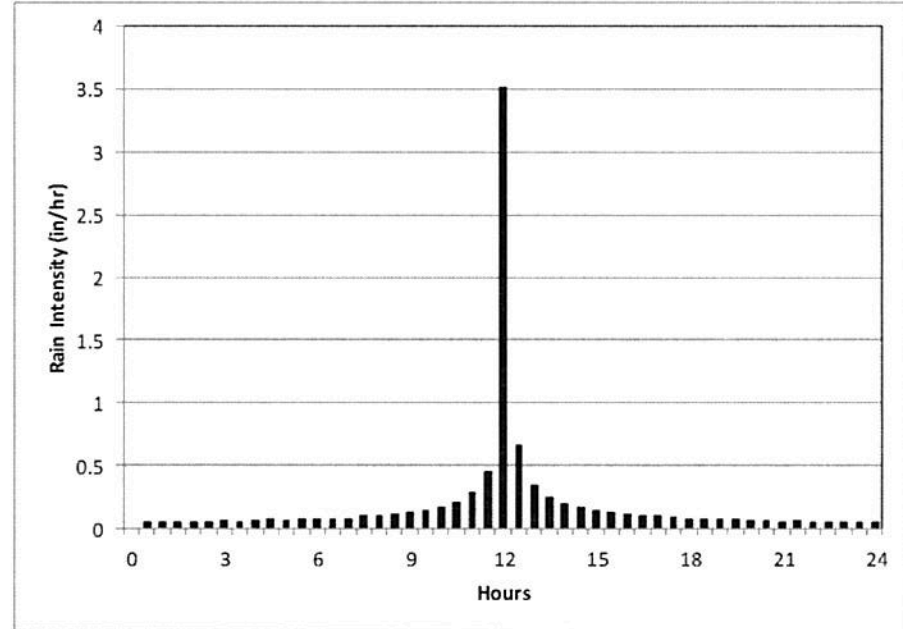


- Phase 1 – current flows
 - Ten alternatives evaluated
 - Results presented in Phase 1 Report – 1/13
- Phase 2 – future flows
 - Two rounds of alternatives evaluations
 - Closely coordinated with the WLSP
 - Identify best “combined” solution

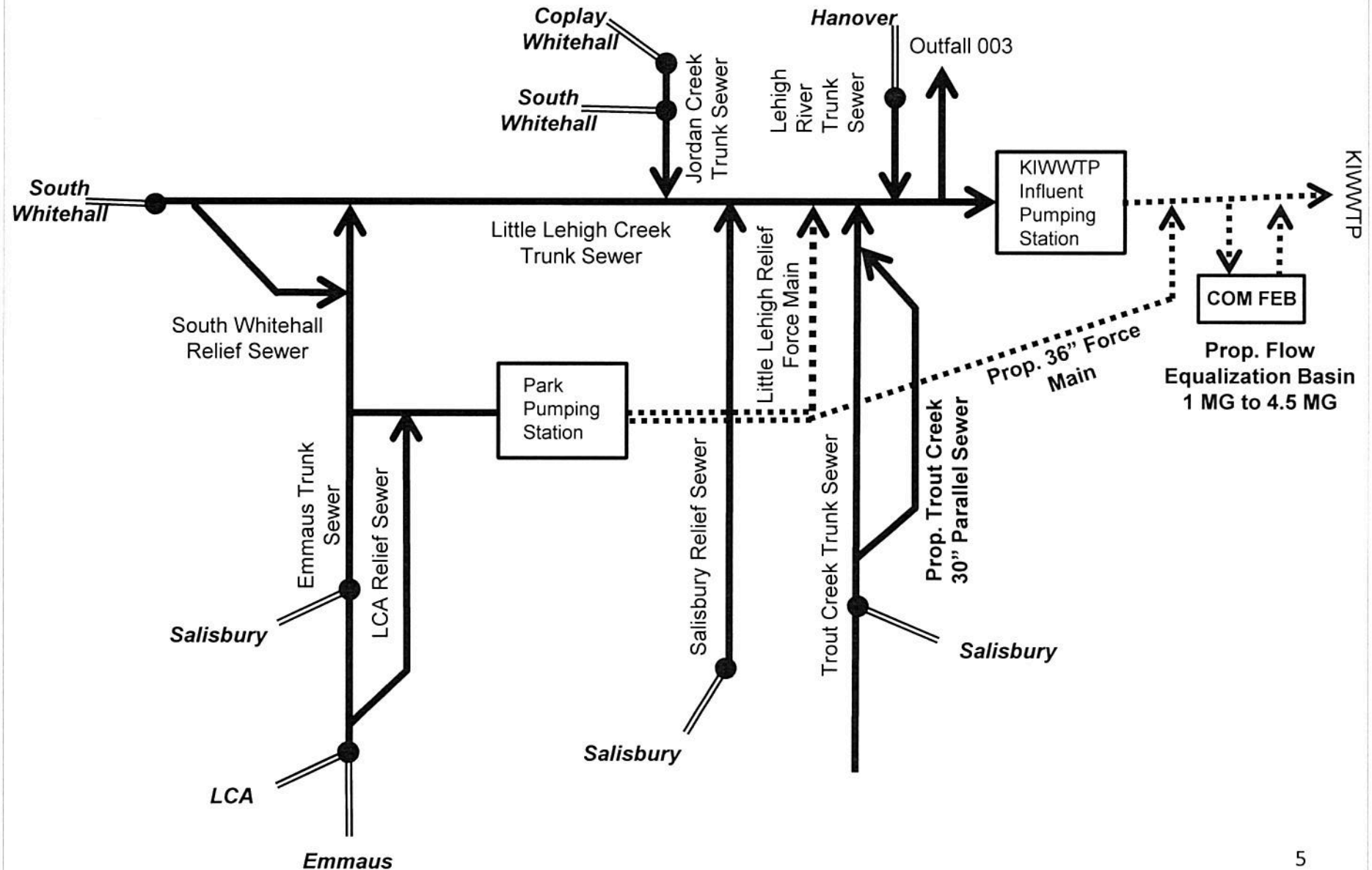
COA Phase I Corrective Action Plan Recap



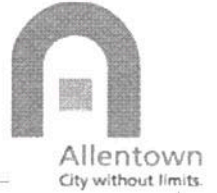
- Fully calibrated model to 2008 flow data
- Modified-calibrated version to account for high groundwater
- 10 Year Storm LOC
- COA Alternative 10
 - Combination of improvements
 - Zero overflows under both models



COA Phase 1 Alternative 10 Improvements



COA Phase 2 Corrective Action Plan

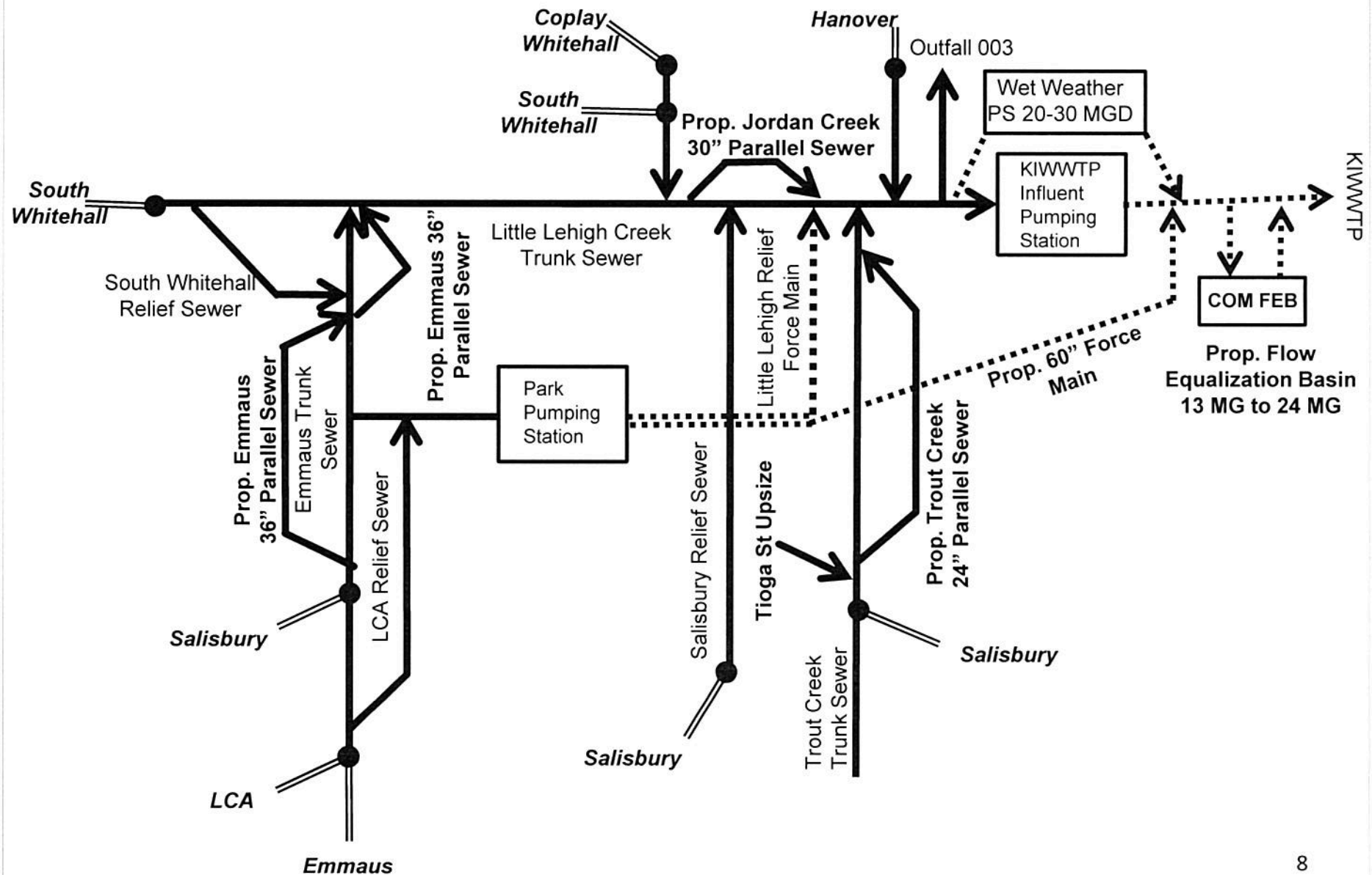


- Future 2040 flows
 - From 537 Plan Update
- 10 Year Storm LOC
- Close coordination with WLSP
 - WLSP alternatives have varying impact on peak flow to the KIWWTP
- Developed through two rounds of evaluations

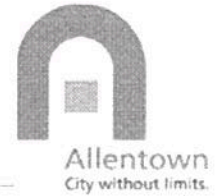
COA Round 1 Alternatives Evaluation

- Bracketing approach used for Round 1 alternatives evaluation
 - Based on the three WLSP alternatives that generate the maximum to minimum range of flows to the KIWWTP
- WLSP Alternatives selected for bracketing
 - “Alternative 2” – convey all flows to City
 - “Alternative 6” – RDII removal and storage
 - “Alternative 12B” – direct discharge
- Non-blending and blending alternatives

Alternatives 2, 6, 12 B Infrastructure Improvements Schematic



Round 2 Modeling and Alternatives Evaluations

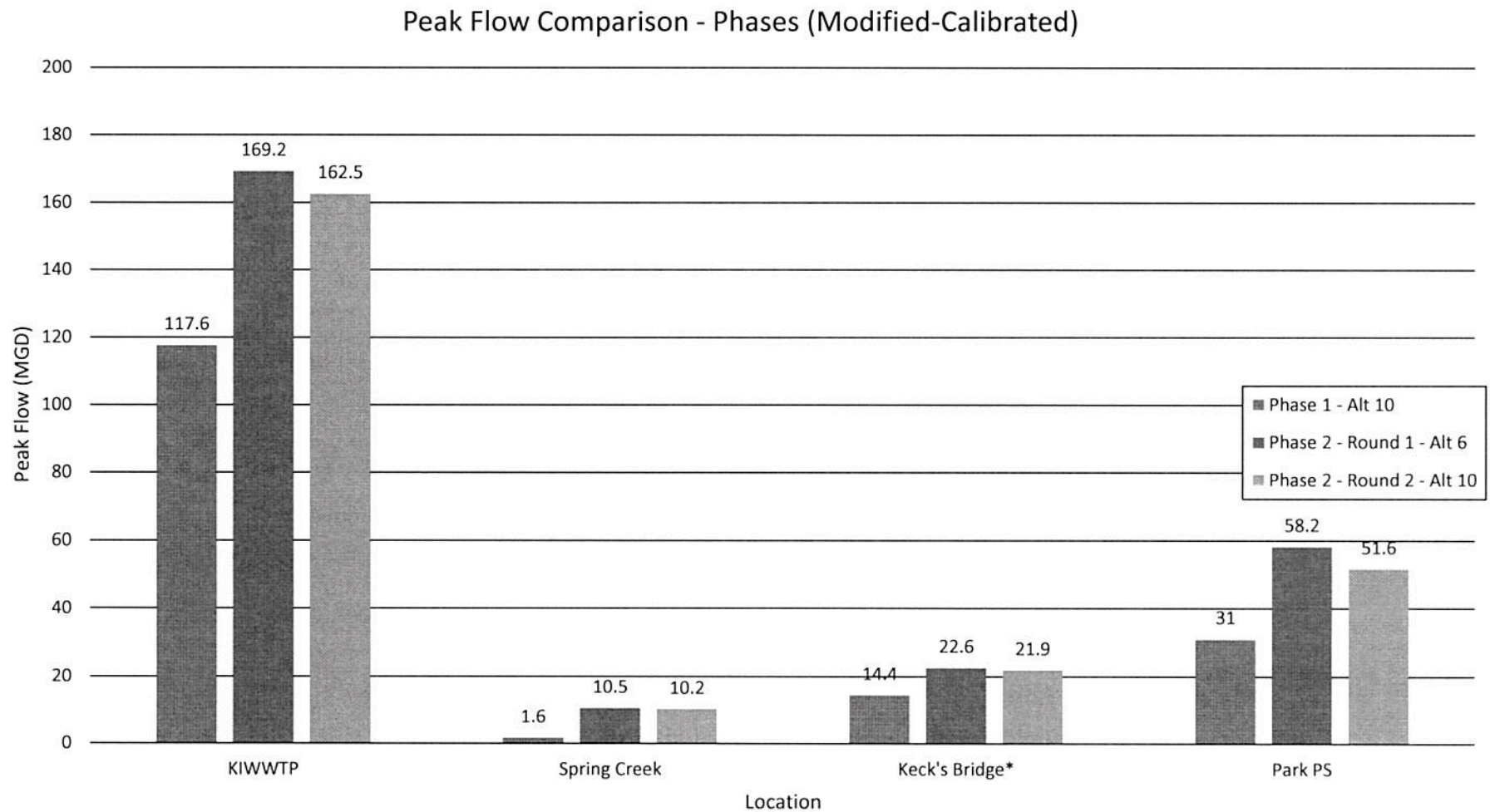


- 2040 future flows consistent with Round 1
- Three flow conditions from WLSP:
 - “Alternative 1” – Convey all flows to City
 - “Alternative 7” – In-Line Storage
 - “Alternative 10” – RDII Removal
- Modelling use to identify and size required improvements for each alternative

Round 2 – Alternative Selection

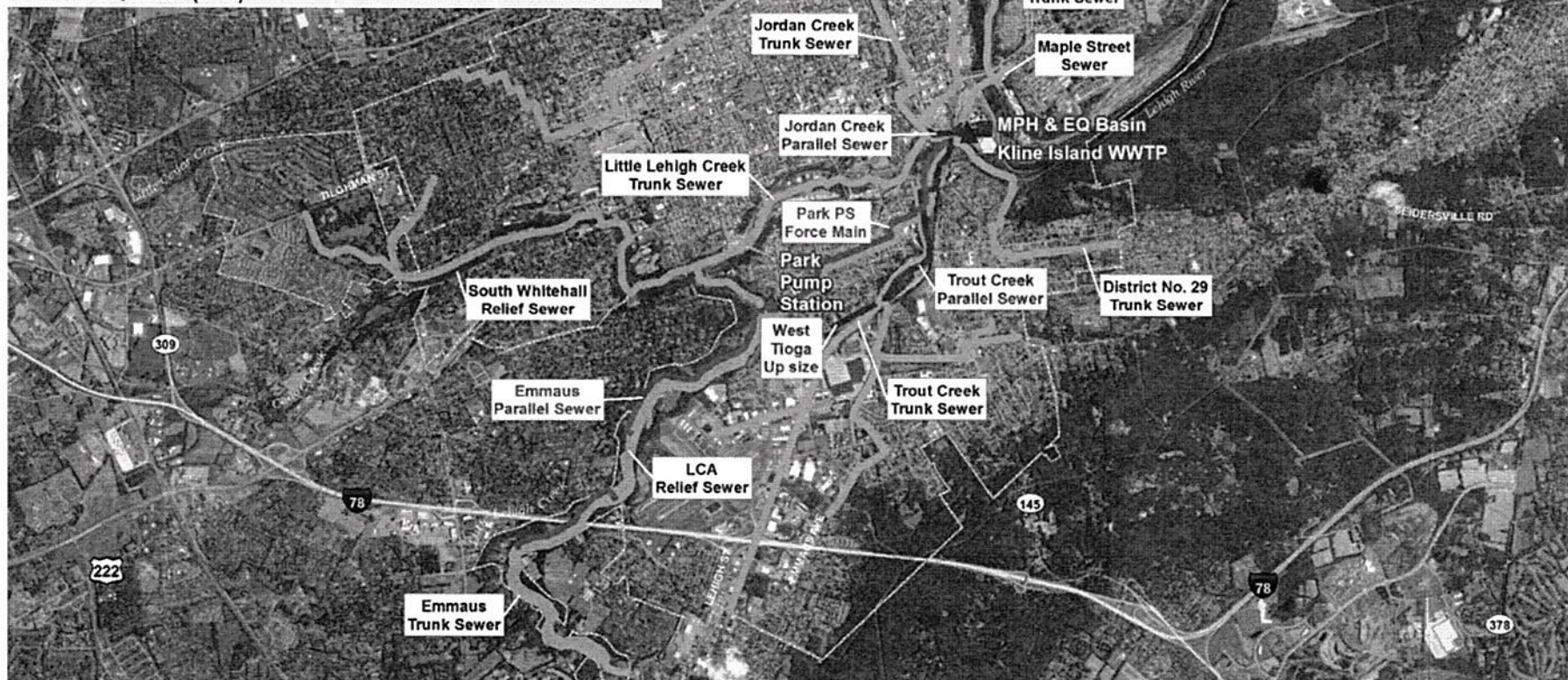
- Preliminary costs developed for each alternative
- Alternative 10 selected by the WLSP
 - The RDII Removal alternative

Peak Flow Comparison – Modified-Calibrated

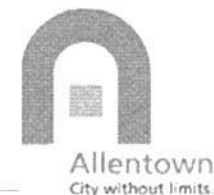


Improvements Necessary under Alternative 10

Alternative 10 Improvements	Calibrated	Modified
Trout Creek Parallel Sewer	7,000 LF 24-in	7,000 LF 24-in
Jordan Creek Parallel Sewer	1,500 LF 30-in	1,500 LF 30-in
W. Tioga St. Sewer Upsize	1,500 LF 10-in	1,500 LF 10-in
Park PS Q (MGD)	41.5	51.6
MPH Q (MGD)	87.4	92.5
Wet Weather PS Q (MGD)	15	20
EQ Basin (MG)	8.1	17.5



Improvements to City Owned Facilities



		CALIBRATED MODEL			MODIFIED - CALIBRATED MODEL			
DESCRIPTION OF ITEM OR ALTERNATIVE COMPONENT	UNITS and APPROX. QUANTITY	APPROX. SIZE	UNIT PRICE ¹	TOTAL PRICE	APPROX. SIZE	UNIT PRICE ¹	TOTAL PRICE	
Trout Creek Parallel Sewer	6,900 LF	24-in	\$775	\$ 5,348,000	24-in	\$775	\$ 5,348,000	
W. Tioga Street Sewer	1,500 LF	10-in	\$235	\$ 353,000	10-in	\$235	\$ 353,000	
Subtotal City of Allentown Costs (Calibrated Model)				\$ 5,701,000	Subtotal City of Allentown Costs (Modified-Calibrated Model) \$ 5,701,000			
MPH Auxiliary Modifications and Wet Weather Pumping Station	LS	15 MGD	\$25,575,000	\$ 25,575,000	20 MGD	\$26,350,000	\$ 26,350,000	
Flow Equalization Basin	LS	8.1 MG	\$30,132,000	\$ 30,132,000	17.5 MG	\$62,387,500	\$ 62,387,500	
Common Facilities (2010 CDM Study)	LS	1	\$11,470,000	\$ 11,470,000	1	\$11,470,000	\$ 11,470,000	
Jordan Creek Parallel Sewer	1,450 LF	30-in	\$1,240	\$ 1,798,000	30-in	\$1,240	\$ 1,798,000	
Subtotal Shared Costs (Calibrated Model)				\$ 68,975,000	Subtotal Shared Costs (Modified-Calibrated Model) \$ 102,005,500			
Emmaus Trunk Parallel Sewer	9,400 LF	30-36-in	\$1,085	\$ 10,199,000	30-36-in	\$1,085	\$ 10,199,000	
Emmaus Trunk Parallel Sewer	1,500 LF	42-in	\$1,535	\$ 2,301,750	42-in	\$1,535	\$ 2,301,750	
Subtotal WLSP Costs (Calibrated Model)				\$ 12,500,750	Subtotal WLSP Costs (Modified-Calibrated Model) \$ 12,500,750			

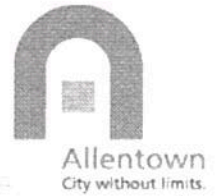
Selected Approach

- Implement improvements in two phases
- Phase 1 – improvements to convey 120 mgd to the KIWWTP
 - Flow equalization or blending at the KIWWTP
- Phase 2 – implement remaining Alternative 10 improvements
 - Refined in size and scope based on the effectiveness of Phase 1 improvements as well as RDII reduction and other improvements implemented by the signatories and WLSP

Phase 1 Improvements

- Phase 1 Improvements to City-owned facilities
 - 4 million gallon flow equalization tank at KIWWTP or blending
 - Influent screening system at KIWWTP
 - Trout Creek parallel Sewer
 - W. Tioga Street sewer – partial upsize
 - Replace impellers of the KIWWTP's main influent pumps
 - Planning-level cost: approximately \$31M
- Other key Phase 1 improvements
 - Extend Park Pump Station force main to the KIWWTP
 - Rehabilitate and restore capacity of Park Pump Station to approximately 24 mgd

Phase 2 Improvements



- Phase 2 Improvements to City-owned facilities
 - Significant additional flow equalization at KIWWTP or blending
 - Significant expansion of influent pumping capacity at KIWWTP
 - Expansion of Influent screening system at KIWWTP
 - Jordan Creek parallel Sewer
 - Planning-level cost: approximately \$80M (modified calibration)
- Other key Phase 2 improvements
 - Significant expansion of PPS pumping and force main capacity
 - Emmaus trunk parallel sewer

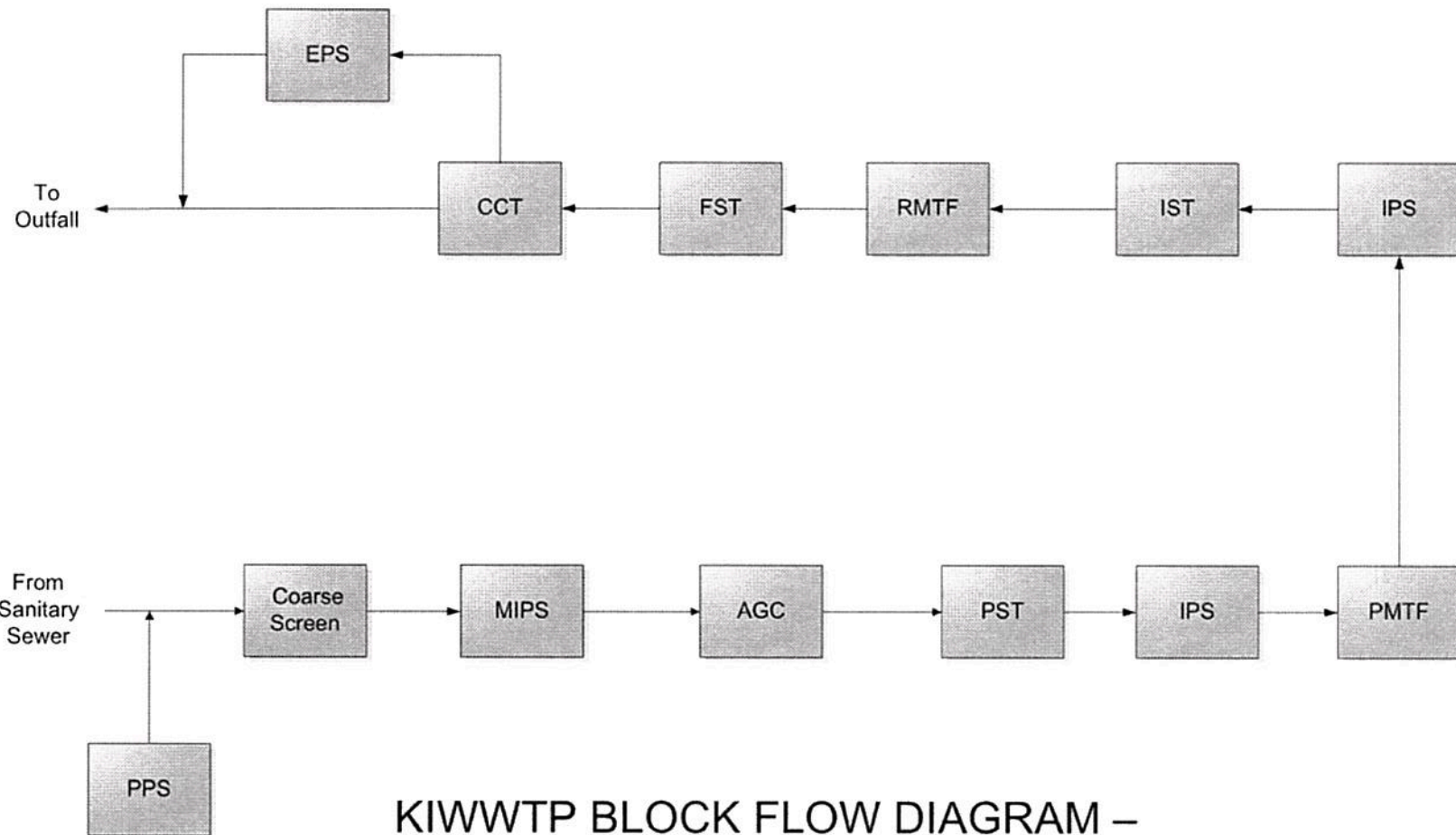
Blending vs Flow Equalization

- Blending Objective
 - Reduce cost by eliminating or reducing size of KIWWTP flow equalization basin
 - Comply with NPDES Instant. Maximum Permit Limits
 - TSS – 60 mg/L
 - CBOD – 40 mg/L
 - NH₃-N – 30 mg/L (winter)
 - NH₃-N – 10 mg/L (summer)
 - Fecal Coliform - 1,000/100 ml (summer)
 - Fecal Coliform – 10,000/100 ml (winter)

Blending vs Flow Equalization

- Approach
 - Evaluated feasibility in 10 mgd increments
 - 90 mgd through 180 mgd
 - Feasibility criteria
 - Ability to comply with all NPDES effluent limits
 - Available space to construct required improvements
 - Budgetary capital cost estimates developed for feasible blending scenarios

Blending vs Flow Equalization



KIWWTP BLOCK FLOW DIAGRAM –
EXISTING CONDITIONS

Blending vs. Flow Equalization



FIGURE 1
KLINE'S ISLAND WWTP
EXISTING CONDITIONS SITE PLAN

City of Allentown, PA
Division of Water Resources

SITE KEY

- A-1 Main Pumping Station
- A-2 Auxiliary Pumping Station
- B Aerated Grit Chambers and Comminutors
- C-1 to C-4 Primary Settling Tanks
- D Primary Sludge Pumping Station
- E-1 to E-4 Plastic Media Trickling Filters
- F Intermediate Pumping Station
- G-1 to G-3 Intermediate Settling Tanks
- H Rock Media Trickling Filters
- I-1 to I-10 Final Settling Tanks
- J Chlorine Contact Tank
- K Chlorination Building
- L Sludge Holding Tanks
- M Sludge Thickening Tanks
- N-1 to N-2 Primary Sludge Digesters
- O Secondary Sludge Digesters
- P Digestion Control Building
- Q Dewatering Building
- R Effluent Pumps

100 0 100 200
SCALE IN FEET
1" = 200'

FEBRUARY 2011



Blending vs. Flow Equalization



Allentown
Pennsylvania

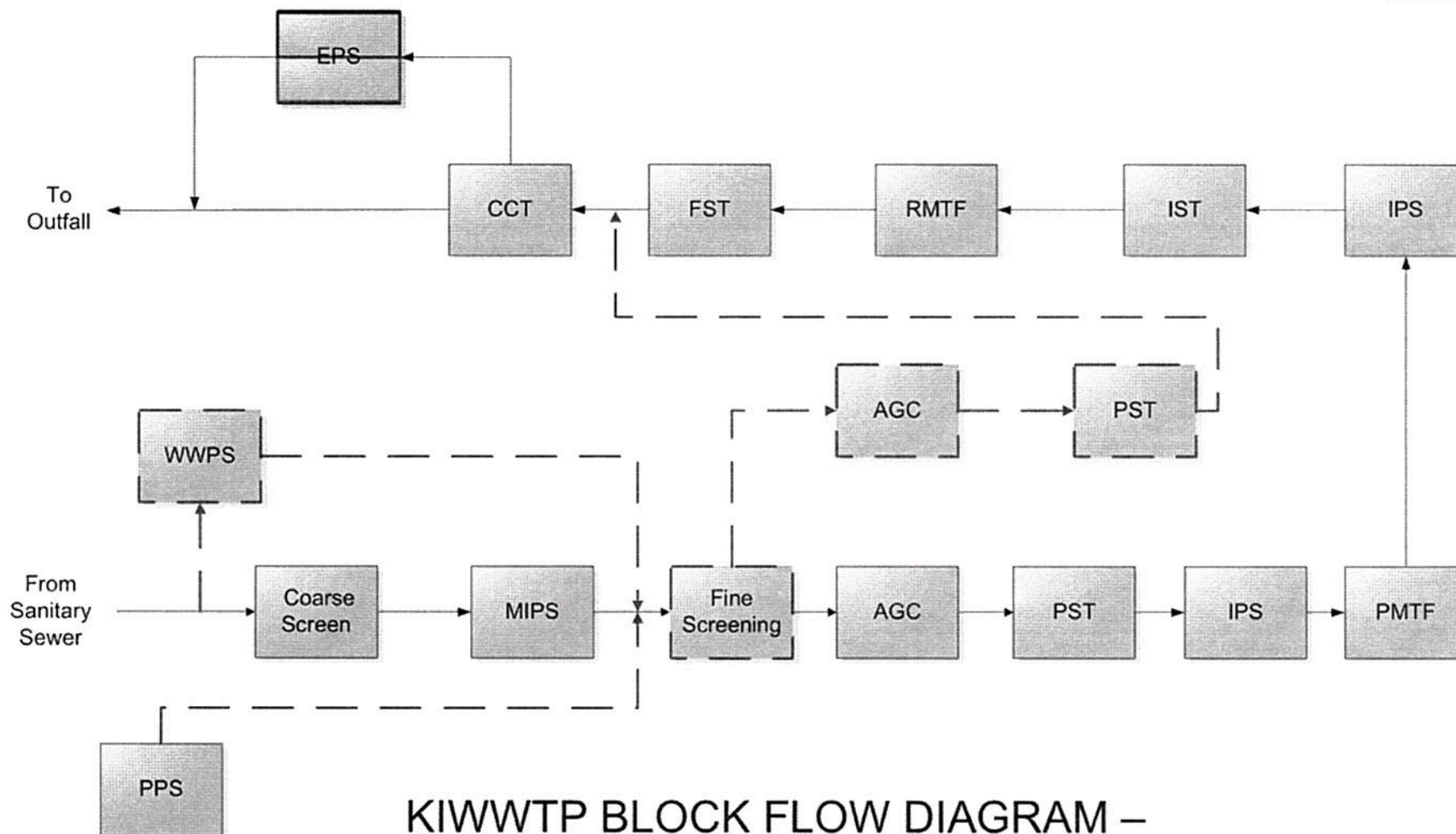


COA Blending Analysis

- Feasible blending scenarios

FLOW MGD	FINE SCREENS	ADDITIONAL AGC	ADDITIONAL PST		ADDITIONAL CCT	NEW EFFLUENT PUMPS
			W/O CEPT	W/CEPT		
80	N/A	N/A	N/A	N/A	N/A	N/A
90	3-4.5'wx10'H	1	N/A	N/A	N/A	2x30 MGD
100	3-4.5'wx10'H	1	1-3300 SF	N/A	N/A	3x30 MGD
110	3-6.0'wx10'H	1	2-3300 SF	N/A	N/A	4x30 MGD
120	3-6.0'wx10'H	1	3-3300 SF	N/A	N/A	5x30 MGD
130	3-6.0'wx10'H	1	4-3300 SF	N/A	N/A	3x30 mgd & 2x40 MGD
140	3-6.0'wx10'H	2	N/A	4-3300 SF	40'Wx32'L	2x30 mgd & 3x40 MG
150	3-7.5'wx10'H	2	N/A	4-3300 SF	40'Wx64'L	1x30 MGD & 4x40 MGD
160	3-7.5'wx10'H	2	N/A	4-3300 SF	40'Wx96'L	5x40 MGD
170	3-7.5'wx10'H	2	N/A	5-3300 SF	40'Wx128'L	2x40 MGD & 3x45 MGD
180	3-7.5'wx10'H	2	N/A	5-3300 SF	40'Wx160'L	5x45 MGD

Blending vs Flow Equalization



KIWWTP BLOCK FLOW DIAGRAM –
PEAK FLOW BLENDING < 140 MGD

Blending vs. Flow Equalization

- Blending Capital Cost Estimates

FLOW MGD	FINE SCREENING	ADDITIONAL AGC	ADDITIONAL PST		ADDITIONAL CCT	NEW EFFLUENT PUMPS	TOTAL CAPITAL COST
			w/o CEPT	w/ CEPT			
80	N/A	N/A	N/A	N/A	N/A	N/A	N/A
90	\$5,443,000	\$1,360,000	N/A	N/A	N/A	\$1,369,000	\$8,172,000
100	\$5,443,000	\$1,360,000	\$2,579,000	N/A	N/A	\$2,053,000	\$11,435,000
110	\$5,715,000	\$1,360,000	\$4,581,000	N/A	N/A	\$2,738,000	\$14,394,000
120	\$5,715,000	\$1,360,000	\$6,580,000	N/A	N/A	\$3,423,000	\$17,078,000
130	\$5,715,000	\$1,360,000	\$9,005,000	N/A	N/A	\$4,251,000	\$20,331,000
140	\$5,715,000	\$2,720,000	N/A	\$9,400,000	\$781,000	\$4,283,000	\$22,899,000
150	\$5,987,000	\$2,720,000	N/A	\$9,400,000	\$1,273,000	\$4,914,000	\$24,294,000
160	\$5,987,000	\$2,720,000	N/A	\$9,400,000	\$1,700,000	\$5,246,000	\$25,053,000
170	\$5,987,000	\$2,720,000	N/A	\$11,400,000	\$2,191,000	\$5,889,000	\$28,187,000
180	\$5,987,000	\$2,720,000	N/A	\$11,400,000	\$2,653,000	\$6,319,000	\$29,079,000

Blending vs Flow Equalization

- Example comparison
 - Planning-level Cost of Round 2 Alternative 10 FEB
 - \$62 million (modified calibration)
 - Planning-Level Cost of 160 mgd blending facilities
 - \$25 million
 - Blending potential cost savings
 - \$37 million
 - Achieves compliance with maximum daily effluent limits
 - Provides additional operational benefits

Questions